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(54) **CAULK GUN PRESSURIZING SYSTEM**

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(52) **U.S. Cl.** **222/380**; 222/89; 222/222; 222/397; 222/39; 137/557
(58) **Field of Search** 222/380, 389, 222/399, 397, 39; 137/557

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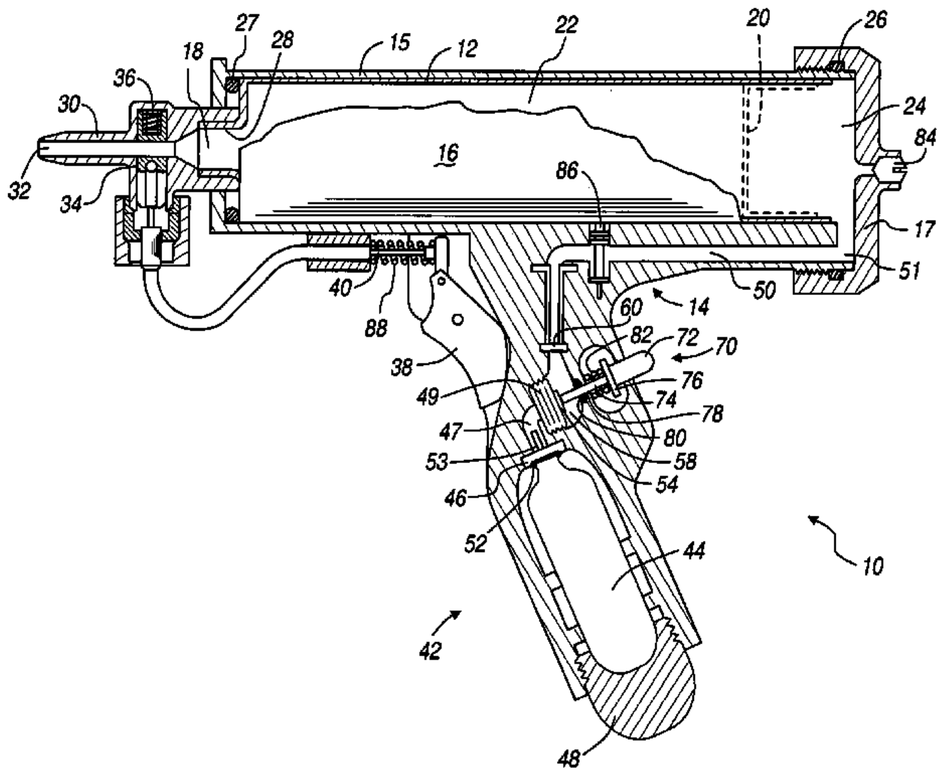
(57) **ABSTRACT**

A device for dispensing a viscous material and a method for controlling the dispensing pressure. The device has a manually actuated control valve, that, when depressed, releases high pressure gas from the source, such as a CO_2 cartridge, into a gas enclosure. An indicator signals a pre-determined pressure in the gas enclosure sufficient to forcefully dispense a viscous material from a product cartridge.

18 Claims, 4 Drawing Sheets



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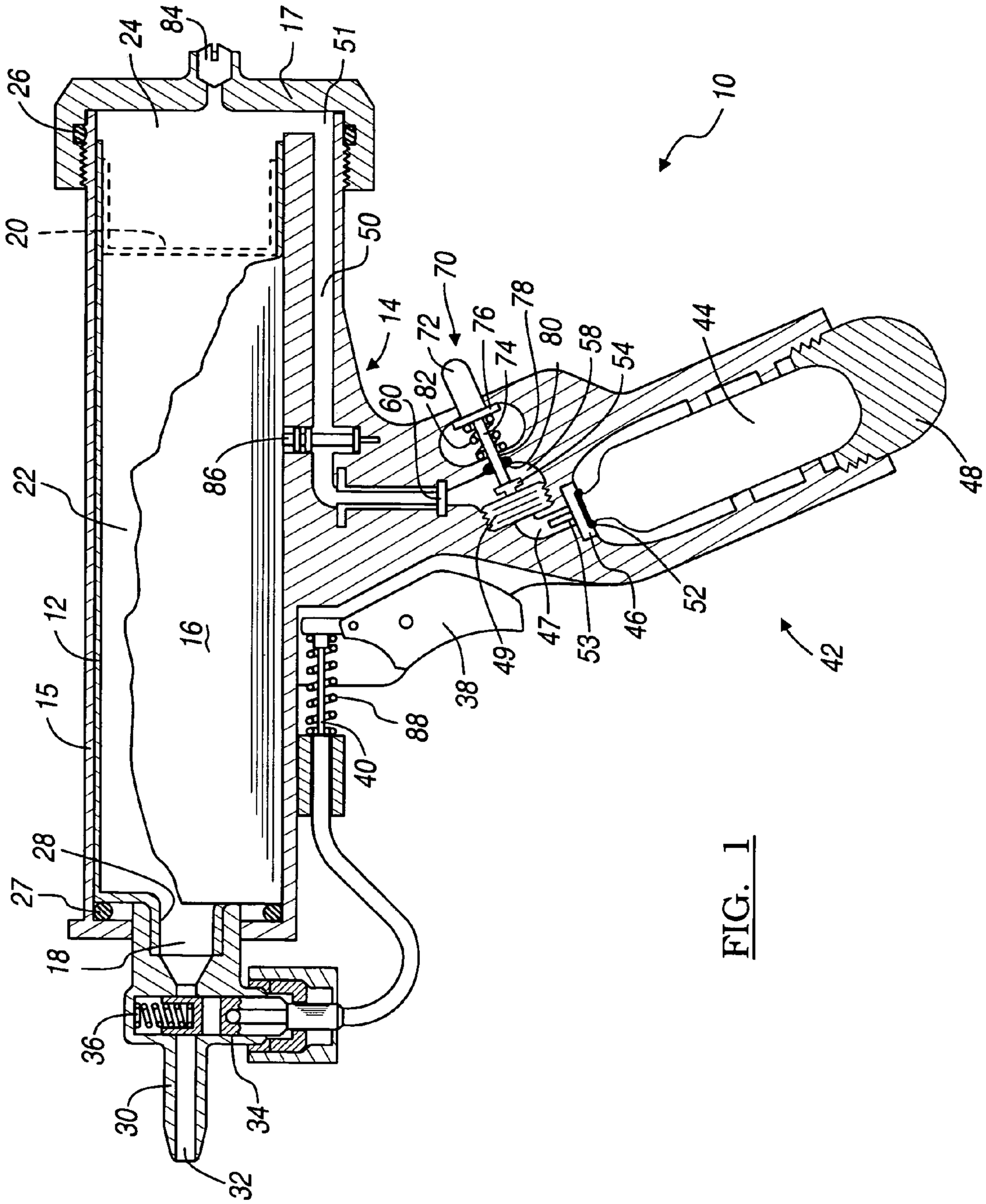
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FIG. 1

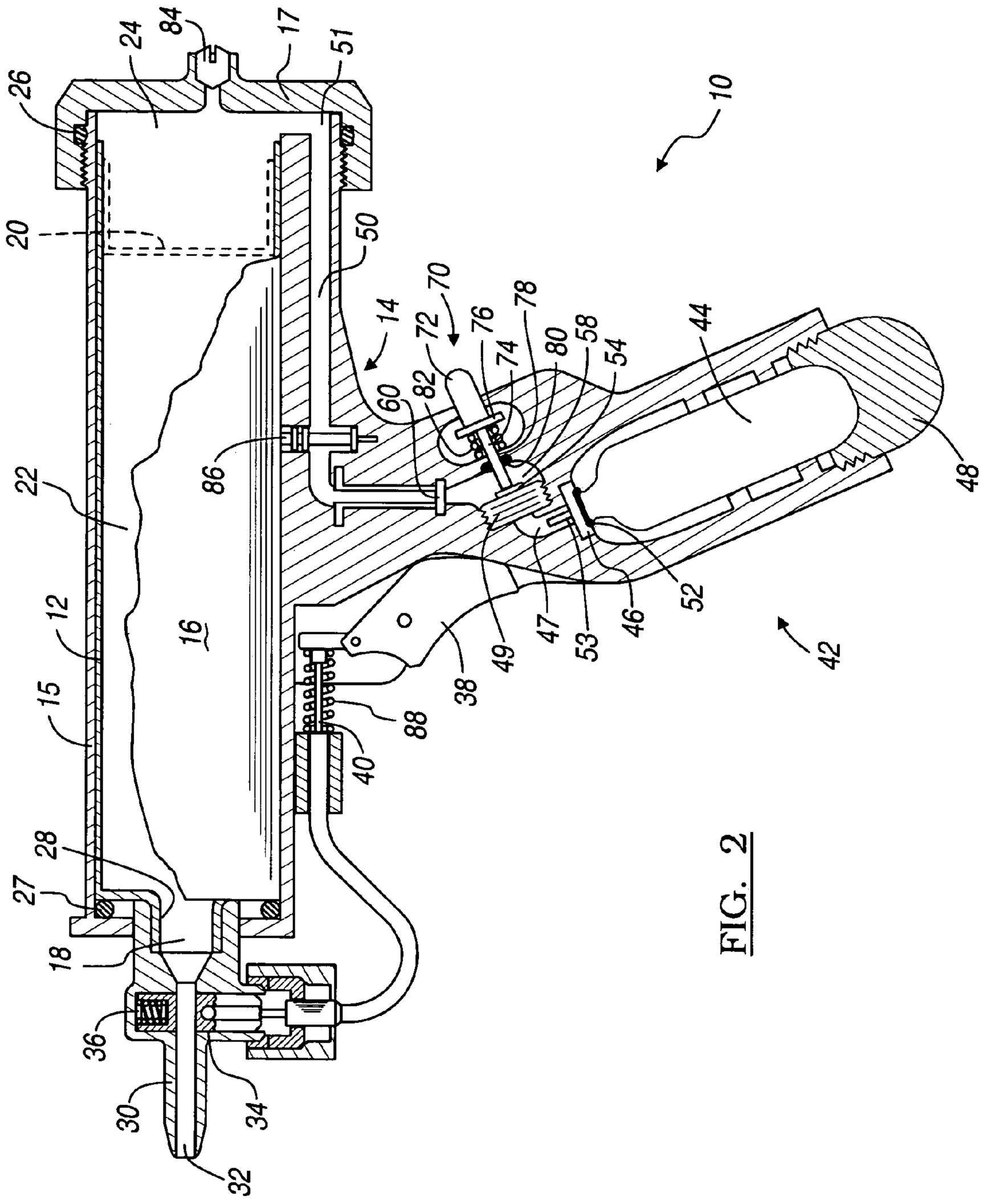
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FIG. 2

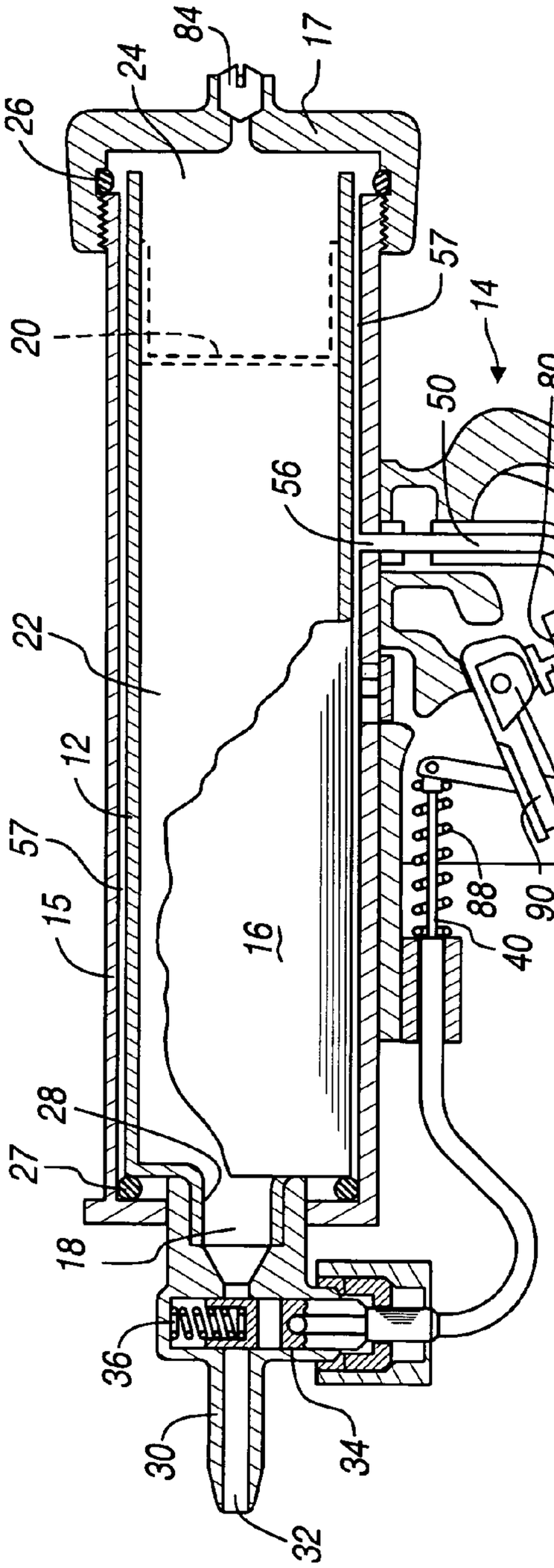
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FIG. 3

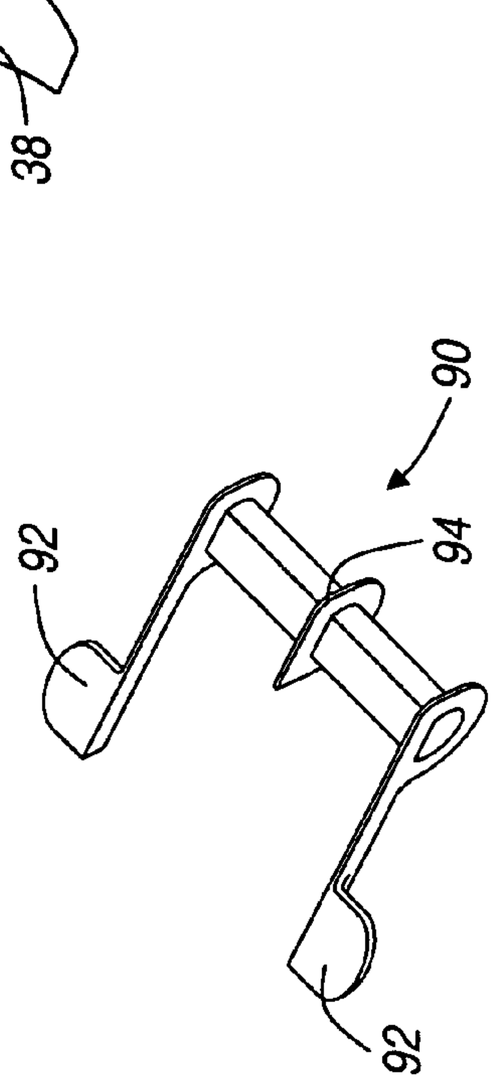
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FIG. 3A

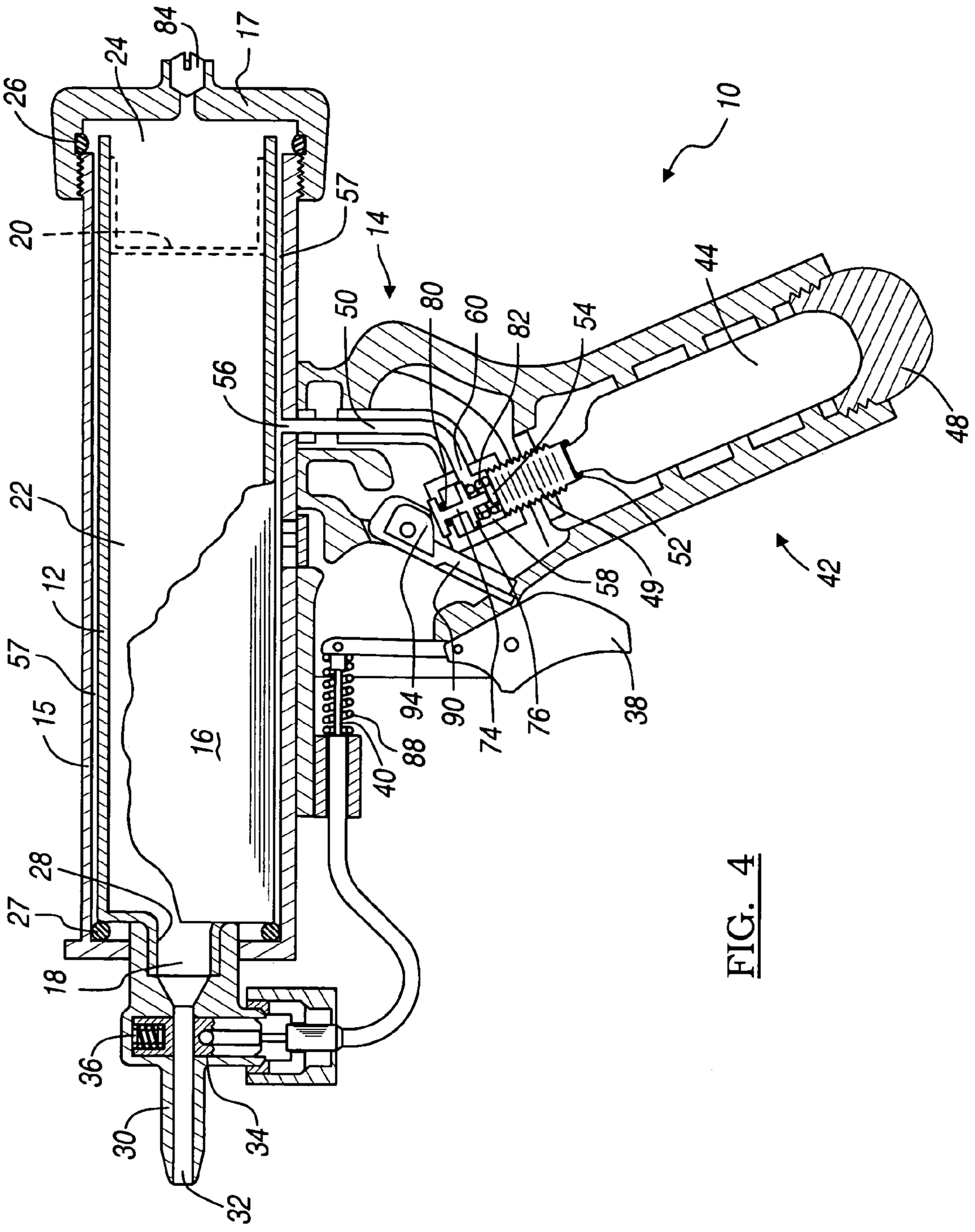
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FIG. 4

CAULK GUN PRESSURIZING SYSTEM

FIELD OF THE INVENTION

The present invention relates to viscous product dispensing devices; and more particularly, to a pressurizing system for gas cartridge driven dispensing devices.

BACKGROUND OF THE INVENTION

In general, pressure driven viscous product dispensing devices receive an input of relatively high pressure gas which is used to output a viscous product at a relatively low pressure. The dispensing devices may typically regulate the high pressure gas using a pressure regulator. In this way, a source of high pressure gas can be used to drive devices that require only a fraction of the high pressure to operate properly. Exemplary sources of high pressure gas include, for example, tanks of compressed air, aerosol containers and commercially available CO_2 gas cartridges.

Unfortunately, pressure regulators can be quite costly. The cost of a pressure regulator can become significant in relation to the overall cost of the device into which it is incorporated. This can be true, for example, in relation to dispensing devices for dispensing a viscous product from a viscous product cartridge. Such viscous product cartridges are commonly used in association with adhesives, caulks and other sealants. During periods of storage or idle periods, the viscous product is constantly exposed to regulated pressure from the high pressure source. Thus, it has been discovered that a low cost, reliable pressurizing system is desirable to minimize the number of possible leak points; particularly for use in dispensing devices for dispensing a viscous product from a viscous product cartridge.

SUMMARY OF THE INVENTION

In accordance with one aspect of the present invention, a device for dispensing a viscous product is provided. The device includes a housing component having a cavity and a dispensing orifice. A movable wall is positioned in the housing cavity and operates to separate a product enclosure from a gas enclosure. A fluid passage provides fluid communication between a pressurized gas source and the gas enclosure. A manually actuated control valve is associated with the pressurized gas source, and is adapted to release pressurized gas into the gas enclosure. The device has a pressure relief valve in fluid communication with the gas enclosure. The relief valve is adapted to indicate a predetermined pressure in the gas enclosure. An operator-activated trigger mechanism is disposed, operable to open the orifice and allow the viscous product to dispense.

In accordance with another aspect of the present invention, a device for dispensing a viscous product from a viscous product cartridge is provided. The dispensing device is adapted to be driven by pressurized gas. The device includes a first housing component adapted to retain the viscous product cartridge and to cooperate with the viscous product cartridge to form a gas enclosure separated from a product enclosure by a movable wall. A second housing component is provided with an inlet in sealed fluid communication with the gas enclosure. A pressurized gas source provides gas to the inlet, and a fluid passage provides fluid communication between the inlet and the gas enclosure. The device also has a manually actuated control valve. The valve has an actuator associated with the pressurized gas source and, upon actuation, releases pressurized gas through the inlet. The control valve is further adapted to return the actuator subsequent the actuation. An operator-actuated trigger mechanism is provided to permit dispensing of the viscous product.

In accordance with yet another aspect of the present invention, a method for facilitating the pressurized discharge of a viscous product from a viscous product cartridge is provided. The method includes providing a dispensing device adapted to receive and discharge a viscous product. A gas enclosure chamber is integrated within a housing of the dispensing device, and a control valve is supplied operable to selectively permit gas flow from a pressurized gas source to a fluid passage. The fluid passage is connected to the gas enclosure, and an indicator is incorporated and adapted to signal a pre-determined pressure in the gas enclosure.

Further areas of applicability of the present invention will become apparent from the detailed description provided hereinafter. It should be understood that the detailed description and specific examples, while indicating the preferred embodiment of the invention, are intended for purposes of illustration only and are not intended to limit the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description and the accompanying drawings, wherein:

FIG. **1** is a cross-sectional illustration of a dispensing device in accordance with one preferred embodiment of the present invention;

FIG. **2** is a cross-sectional illustration of the preferred embodiment of FIG. **1**, shown with a control valve and a dispensing orifice in an open position;

FIG. **3** is a cross sectional illustration of a dispensing device in accordance with a second preferred embodiment;

FIG. **3A** is a magnified, isometric view of a rotary pressurizing trigger of the dispensing device of FIG. **3**; and

FIG. **4** is a cross-sectional illustration of the second preferred embodiment of FIG. **3**, shown with a control valve and a dispensing orifice in an open position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following description of the preferred embodiment(s) is merely exemplary in nature and is in no way intended to limit the invention, its application, or uses. For example, although the pressurizing system of the dispensing device is described herein as preferably being driven by pressurized CO_2 cartridges, other sources of pressurized gas, including aerosol containers and compressed air tanks, may alternatively be used.

As used herein, "pressurized gas cartridge" means a container that is capable of housing a material that can be dispensed from the container in the form of a pressurized gas. Thus, it is possible that the material inside the container is, at least partially, in a form that is not gaseous. Similarly, the phrase "product cartridge" as used herein, means a container capable of housing a product for shipping and/or storage and for dispensing. Thus, the term "cartridge" does not, in itself, require any specific structural configuration.

Referring to FIGS. **1** and **2**, one preferred embodiment of a dispensing device **10** for dispensing a viscous product from a viscous product cartridge **12** is illustrated. Tubular viscous product cartridges **12** are commonly used in con-

junction with or in association with construction adhesives, sealants and caulks. The dispensing device **10** includes a housing **14**. The housing **14** includes a pressure vessel, or upper cavity that operates as a cylindrical product cartridge housing component **15**. This product cartridge housing component **15** is adapted to retain the viscous product cartridge **12**. In the illustrated embodiments, the cartridge housing component **15** is a cylindrical, tubular vessel having a relatively rigid cylindrical wall **16** and is sealed with a removable cap **17**, for loading and unloading tubular viscous product cartridges **12**.

At one end of such cylindrical tubular product cartridge **12** is a dispensing orifice **18**. The dispensing orifice **18** may be provided, for example, by cutting the end of a nozzle (not shown) that is typically provided on many such commercially available viscous product cartridges **12**. In addition, it may be necessary to rupture an internal seal (not shown) at the base of the nozzle that seals the dispensing orifice **18** and is often also included in such commercially available product cartridges **12**. At the opposite end of the product cartridge **12** is a piston **20** that seals the end of the tube **12**. The piston **20** operates as a movable wall that is capable of forcing product from the product enclosure **22** through the dispensing orifice **18** as the piston **20** moves toward the dispensing orifice **18**.

As indicated above, the upper portion of the housing **14** operates as a product cartridge housing component **15**. The product cartridge housing component **15** is adapted to cooperate with the viscous product cartridge **12** to form a gas enclosure **24** separated from the product enclosure **22** by the movable piston **20**. In this embodiment, the removable retaining cap **17** threadedly seals the product cartridge **12** in the product cartridge housing component **15** and uses an O-ring **26** to form a gas enclosure **24** between the housing **14**, removable cap **17**, and the product cartridge **12**. The piston **20** or movable wall separates the gas enclosure **24** from the product enclosure **22** formed inside the product cartridge **12**.

Although this embodiment uses product cartridges having a relatively rigid cylindrical wall and a movable piston **20**, an alternative product cartridge (not shown) is made of flexible thin-film packaging material. The corresponding product cartridge housing component **15** of this alternative embodiment can still use a movable piston **20** to dispense the product as previously described, or it can be modified providing a gas enclosure that surrounds the flexible side walls. Thus, the side walls can move toward each other under external pressure within the gas enclosure to force product through the dispensing orifice. Accordingly, the flexible thin-film side walls provide the movable wall(s) in this alternative embodiment. It should be understood that additional product cartridge designs can also be used with the present invention, including commonly used squeeze or press tube type cartridges having a substantially cylindrical shape tapered to a flat seal on one end with a dispensing orifice on an opposite end.

The upper portion of the housing **14** also includes a nozzle housing component **30** which is adapted to seal with a wall **28** of the product cartridge **12** that surrounds the dispensing orifice **18**. As indicated above, this dispensing orifice **18** can be provided by trimming the end of a nozzle from a standard caulk or adhesive product cartridge. An O-ring **27** is provided for a front pressure seal. Similarly, a rubberized gasket (not shown) may be provided between the nozzle housing component **30** and the wall **28** of the product cartridge **12** to facilitate this seal. As another possible alternative, threads (not shown) may be provided to enable threaded engagement between the wall **28** of the product cartridge **12** and the nozzle housing component **30** to facilitate the seal therebetween.

The nozzle housing component **30** includes a dispensing passage **32** which is selectively opened and closed by a valve body **34**. A spring **36** biases the valve body **34** downwardly into a closed position in which the dispensing passage **32** of the nozzle **30** is sealed as seen in FIG. **1**. Actuation of a manually operated dispensing trigger **38** causes a cable **40** to counteract the biasing force of the spring **36** and push the valve body **34** upwardly into a dispensing or open position as shown in FIG. **2**. In this open position, product can be dispensed from the product cartridge **12** through the dispensing orifice **18** of the product cartridge **12** and through the dispensing passage **32** of the nozzle housing component **30**.

In an alternative embodiment (not shown), the nozzle, including the valve body and dispensing passage, may be integrally provided as part of the product cartridge, rather than as part of the housing. This configuration eliminates the need to seal the dispensing orifice of the product cartridge and the dispensing passage of the device housing together. In contrast, the preferred embodiment described above enables re-use of the nozzle and valve assembly with multiple disposable product cartridges.

As indicated above, a lower portion of the housing **14** of the dispensing device **10** operates as a handle **42** for manually grasping the dispensing device **10**. The manually actuated dispensing trigger **38** mentioned above is associated with the handle **42**. In a preferred embodiment, the handle provides a gas cartridge housing component **42**. The gas cartridge housing component **42** is adapted to retain a gas cartridge **44** in sealed fluid communication with an inlet **46** that is associated with a manually actuated control valve **49**. A fluid passage **50** provides fluid communication between the gas enclosure **24** and the inlet **46** located in the handle portion **42** of the housing **14**.

Specifically, the inlet **46** adjacent to the gas cartridge **44** includes a resilient gasket seal member **52**. In addition, the inlet **46** may include a piercing member **53** to pierce an opening in the gas cartridge **44** upon sealing to the inlet **46**. The gas cartridge housing component **42** includes a removable housing member **48**. As this housing member **48** is screwed onto the gas cartridge housing component **42**, the CO_2 gas cartridge **44** is pushed into sealing engagement with the gasket **52** of the inlet **46**. If present, screwing the housing member **48** onto the gas cartridge housing component **42** causes the piercing member **53** to pierce the gas cartridge **44**. In any event, sealed fluid communication is provided between the interior of the gas cartridge **44** and the fluid passage **50**.

In the illustrated embodiment, the manually actuated control valve **49** associated with the inlet **46** is a standard Schrader valve. While the illustrated embodiments in FIGS. **1** and **2** depict the inlet **46** in direct communication the gas cartridge **44**, alternatively FIGS. **3** and **4** have the control valve **49** sealing the gas cartridge **44** after it has been pierced during installation. Such valves are quite well known to those skilled in the art, and therefore, the complete structural details of the control valve **49** have not been illustrated in the drawings. In brief, the Schrader valve includes a valve stem **54** which operates as an actuator that, when depressed, opens the valve **49** to allow gas to pass through the valve **49**. This position of the stem **54** corresponds to an open position of the valve **49** and is illustrated in FIGS. **2** and **4**. When the valve stem **54** is released, it is biased to move outwardly into a closed position that prevents gas from passing through the

valve **49**. This position of the stem **54** or actuator corresponds to a closed position of the valve **49** and is illustrated in FIGS. **1** and **3**.

The overall fluid passage **50** and the gas enclosure **24** define an operator-regulated gas pressure enclosure. The overall fluid passage **50** includes a passage through the Schrader valve **49** and the initial cavity **58** into which gas exiting the Schrader valve **49** flows. In addition, the overall fluid passage can include an opening **60** through which gas exits the initial cavity **58** and continues through the passage **50** extending to the gas enclosure **24**. It should be understood that the fluid passage **50** will vary depending upon the housing design and the desired method of pressurizing the gas enclosure. As shown in FIGS. **1** and **2**, the fluid passage **50** extends toward the retaining cap **17**, and pressurizes the gas enclosure **24** via outlet **51** directed near the movable wall **20**. Alternatively, as shown in FIGS. **3** and **4**, fluid passage **50** is in fluid communication with a center portion **56** of the cartridge housing component **15**. In this embodiment, the viscous product cartridge **12** is preferably smaller than the cartridge housing component **15** enabling pressurized gas to surround the entire cartridge **12** periphery, thereby filling a gap **57** between the cartridge housing component **15** and the cartridge **12** and allowing the pressurized gas to act upon the movable wall **20**.

With reference to FIGS. **1** and **2**, a pressurizing trigger **70** is located adjacent the initial cavity **58** and valve stem **54**. Preferably, pressurizing trigger **70** is positioned on the handle **42** such that a user can engage the dispensing trigger **38** and the pressurizing trigger **70** with digits from the same hand. The pressurizing trigger **70** includes an exterior button **72**, a shaft **74**, and a stop **76**. Trigger **70** is adapted to slidingly retract into initial cavity **58** and to engage the valve stem **54**. Shaft **74** is guided by a shaft passageway **78** that includes an O-ring **80** to provide a fluid sealing interface. Spring **82** is superposed on shaft **74** and biases shaft **74** away from valve stem **54**. Stop **76** limits the outward travel of trigger **70** and serves as a spring seat.

Upon inserting the CO_2 cartridge **44** into the cartridge housing **42** and threading the housing member **48**, the cartridge **44** is sealed to the inlet **46** of the inlet area **47**. The biasing force of the spring **82** initially keeps the shaft **74** of the pressurizing trigger **70** opposed from the valve stern **54**. Once the pressurizing trigger **70** is engaged, shaft **74** linearly actuates the valve stem **54** of the control valve **49** allowing gas flow from the pressurized cartridge **44** through the inlet area **47** and across the control valve to the initial cavity **58** which is part of the operator-regulated gas pressure enclosure. Pressure within the initial cavity **58** increases and gas flows through an opening **60** to the fluid passage **50** to the gas enclosure **24**.

As pressure within the gas enclosure **24** increases, the gas pressure therein generates a force that acts upon the face of the piston, or movable wall **20**. Once the pressure reaches a pre-determined value, the main pressure-relief valve **84** begins to leak or whistle, thereby producing an audible signal informing the operator that the device holds a sufficient pressure in the gas enclosure **24** to allow dispensing of the viscous product. Preferably, the relief pressure is adjustable between about 15 and 75 psi to accommodate different types of sealant, caulk, and viscous products. The preset relief pressure should be selected to affect a desirable dispensing rate of product without unnecessarily increasing the pressure in the gas enclosure **24**. Alternative embodiments include the use of pressure gauges or other visual indication means as are known to those skilled in the art. An emergency relief valve **86** is also present to release excess gas to the atmosphere via a passage (not shown) in the event a pressure in the gas chamber **24** reaches a threshold, or maximum value. It should be understood that the placement of the emergency relief valve will vary depending upon the housing design of the device **10**.

In one embodiment, the main pressure relief valve **84** can be adjusted to control the amount of gas pressure required to pneumatically initiate the audible signal. Variable pressure relief valves are generally known in the art. Typical valves include a housing with an orifice and a channel that threadedly engages with an adjustment screw having a gas vent therein. A plug is disposed between the screw and the orifice, separated by a tension spring. As the adjustment screw is rotated in a clockwise direction, the spring tension increases on the plug and a higher pressure is required through the orifice to displace the plug. Similarly, as the adjustment screw is rotated in a counter-clockwise direction, the pressure required to release the plug is reduced. The hole in the gas vent can be formed with a pre-determined diameter adapted to generate a whistling type noise at a desired pressure threshold.

Additionally, the main pressure relief valve **84** may be manually moved to an open position to permit the release of pressure from the gas enclosure **24**. This release of pressure can, for example, facilitate the replacement of the viscous product cartridge **12**. In an alternative and simpler embodiment, the device is not equipped with a signal producing relief valve or indicator. In this case, the user of the device is instructed by the manufacturer to pressurize the gas chamber by activating the pressurizing trigger **70** for a pre-determined time, thereby pressurizing the gas enclosure **24** to a sufficient pressure to allow the dispensing of the viscous product.

Once the device **10** is pressurized, the user can engage the dispensing trigger **38** which causes the cable **40** to counteract the biasing force of the spring **36** and push the valve body **34** to the dispensing position, allowing the release of viscous product from the tip of the dispensing passage **32**. The dispensing trigger **38** is biased to a closed position by a spring **88**. The dispensing trigger **38** is connected to the nozzle valve **34** and opens the valve upon manual actuation. As the piston **20** begins to move, the volume of the gas enclosure **24** expands, reducing the volume of the product enclosure **22** and dispensing product from the dispensing passage **32**. Upon release of the dispensing trigger **38**, the discharge valve **34** moves to its closed position and product is no longer dispensed.

During the dispensing operation, the increase in size of the gas enclosure **24** causes the pressure level within the overall regulated gas pressure enclosure, including the initial cavity **58**, to fall. When the pressure level falls significantly after continuous dispensing, the user will need to re-pressurize the system by engaging the pressurizing trigger **70**, **90** again, either for a designated time period or until an indicator indicates a suitable operating pressure, as previously described.

Operation of the dispensing device **10** involves locating a product cartridge **12** in the product cartridge retaining housing compartment **15**. As previously described, this creates a gas enclosure **24** separated from a product enclosure **22** by a movable wall **20**. In addition, operation of the dispensing device involves locating a CO_2 cartridge **44** inside the gas cartridge retaining housing component **42**. This is accomplished by screwing on the housing member **48** to the gas cartridge housing unit.

Referring to FIGS. **2** and **4**, manually actuating the dispensing trigger **38** causes the nozzle valve to move to an

open position. Pressurized gas from the gas enclosure **24** forces the movable wall **20** to slide towards the dispensing nozzle, thereby displacing viscous product through the dispensing passage **32**.

Referring to FIGS. **3** and **4**, a second preferred embodiment of a dispensing device **10** for dispensing a viscous product from a viscous product cartridge is illustrated. This embodiment provides a rotary driven pressurizing trigger **90**. Although the rotary trigger **90** and corresponding components are not identical to the pressurizing trigger of FIGS. **1** and **2**, they function in the same manner. The rotary trigger **90**, as shown in FIG. **3**A, has at least one external thumb control lever **92**, which is operable to rotate a cam **94** when depressed by the device operator. The rotary trigger **90** is similarly positioned in the handle **42** such that a user can engage the dispensing trigger **38** and the rotary trigger **90** with digits from the same hand. The cam **94** is adapted to rotatably engage the valve stem **54** of the control valve **49** allowing gas flow from the pressurized cartridge **44** through the control valve and into the initial cavity **58**. Pressure within the initial cavity **58** increases and flows to the fluid passage **50** and into the gap **57** and to the gas enclosure **24**. The remainder of this embodiment is essentially identical in form and function to the embodiments of FIGS. **1** and **2**. Consequently, the remainder of this embodiment is not described here again.

Only a small number of the many possible alternatives are described above. Many additional modifications and alternatives beyond those described above, may be envisioned by those skilled in the art. For example, as illustrated in FIGS. **1** and **2**, the Schrader valve is associated with the inlet of the fluid passage as a result of being located within the fluid passage. In another embodiment illustrated in FIGS. **3** and **4**, the pressurized gas cartridge includes the Schrader valve. Thus, the Schrader valve is associated with the inlet of the fluid passage when the pressurized gas cartridge is associated with the inlet. As another potential modification, the pressurizing trigger may be disposed at other convenient locations on the handle portion of the housing. In other modifications, the operator actuated control elements may be provided with locks and other adjustable control settings.

The description of the invention is merely exemplary in nature and, thus, variations that do not depart from the gist of the invention are intended to be within the scope of the invention. Such variations are not to be regarded as a departure from the spirit and scope of the invention.

What is claimed is:

1. A device for dispensing a viscous product, the device comprising;

a housing component having a cavity and a dispensing orifice;

a movable wall positioned in said cavity operable to separate a product enclosure from a gas enclosure;

a fluid passage providing fluid communication between a pressurized gas source and said gas enclosure;

a manually actuated control valve associated with said pressurized gas source, said control valve having an actuator which, upon actuation, is adapted to release gas from said pressurized gas source into said fluid passage and said gas enclosure;

a pressure relief valve in fluid communication with said gas enclosure;

an operator-activated trigger mechanism operable to open said orifice; and

a second operator-activated trigger mechanism located adjacent said actuator of said control valve and operable to engage said actuator;

wherein said movable wall is configured to move in response to a force exerted by said pressurized gas enclosure so as to cause the viscous product to dispense from said orifice.

2. A device for dispensing a viscous product according to claim **1**, wherein said pressure relief valve is adapted to indicate a pre-determined pressure in said gas enclosure.

3. A device for dispensing a viscous product according to claim **2**, wherein said pressure relief valve produces an audible signal.

4. A device for dispensing a viscous product according to claim **3**, wherein an adjustment mechanism is associated with said pressure relief valve operable to adjust said pre-determined pressure.

5. A device for dispensing a viscous product according to claim **2**, wherein said second operator-activated trigger mechanism engages said actuator upon linear movement.

6. A device for dispensing a viscous product according to claim **1**, wherein said second operator-activated trigger mechanism engages said actuator upon rotary movement.

7. A device for dispensing a viscous product from a viscous product cartridge, the device comprising:

a first housing component adapted to retain the viscous product cartridge and operable to cooperate with the viscous product cartridge to form a gas enclosure separated from a product enclosure by a movable wall;

a second housing component having an inlet in sealed fluid communication with said gas enclosure;

a fluid passage providing fluid communication between said inlet and said gas enclosure;

a pressurized gas source in fluid communication with said inlet;

a manually actuatable control valve having an actuator and associated with said pressurized gas source, which, upon actuation, is operable to release gas from said pressurized gas source through said inlet and into said fluid passage, and said manually actuatable control valve further adapted to return said actuator to a closed position subsequent said actuation;

an operator-actuated trigger mechanism adapted to permit dispensing of the viscous product; and

a second operator-activated trigger mechanism located adjacent said actuator of said control valve, wherein engagement of said second trigger actuates said control valve, thereby releasing a pressurized gas into said gas enclosure.

8. A device for dispensing a viscous product according to claim **7**, further comprising a pressure relief valve in fluid communication with said gas enclosure.

9. A device for dispensing a viscous product according to claim **8**, wherein said pressure relief valve cooperates with a pneumatic indicator to produce an audible signal when a pressure in said gas enclosure exceeds a pre-determined pressure.

10. A device for dispensing a viscous product according to claim **9**, wherein an adjustment mechanism is associated with said pressure relief valve operable to adjust said pre-determined pressure.

11. A device for dispensing a viscous product according to claim **9**, wherein said pressure relief valve is adjustable between about 15 and about 75 psi.

12. A device for dispensing a viscous product according to claim **7**, wherein said trigger mechanism is operable to engage said actuator upon linear movement.

13. A device for dispensing a viscous product according to claim **7**, wherein said trigger mechanism is operable to engage said actuator upon rotary movement.

14. A device for dispensing a viscous product according to claim **7**, wherein said second housing is adapted to retain said pressurized gas cartridge.

15. A device for dispensing a viscous product according to claim **7**, wherein said movable wall is a wall of the viscous product cartridge.

16. A method for facilitating the pressurized discharge of a viscous product from a viscous product cartridge, the method comprising:

providing a cavity in a dispensing device adapted to discharge the viscous product from the viscous product cartridge;

integrating a gas enclosure chamber within a housing of said dispensing device;

supplying a control valve adapted to selectively permit gas flow from a pressurized gas source to a fluid passage;

connecting said fluid passage to said gas enclosure;

incorporating an indicator operable to signal a pre-determined pressure in said gas enclosure;

opening an orifice to discharge the viscous product from the viscous product cartridge with an operator-activated trigger mechanism; and

opening said control valve to selectively permit gas flow from said pressurized gas source to said fluid passage with a second operator-activated trigger mechanism.

17. A method according to claim **16**, wherein said signal is audible and driven by pneumatic means.

18. A method according to claim **16**, further comprising providing a recommended time for allowing pressurization of said gas enclosure.

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